

PATENT ABSTRACTS OF JAPAN

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(54) OPTICAL REFLECTOR

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an optical reflector capable of preventing its color from being changed for a long period, without causing such discoloration as white polyester films conventionally change into yellow.

SOLUTION: This optical reflector comprises a biaxially-drawn film containing a thermoplastic resin and a filler and having an opacity of $\geq 95\%$, a whiteness of $\geq 90\%$, a reflection factor of $\geq 92\%$, and an areal draw ratio of 22-80, wherein the reflector has a color difference (ΔE_H) of ≤ 10 which is measured after irradiated at an irradiation intensity of 90 mW/cm² for 10 hr by using a metal halide lamp placed at a distance of 10 cm under an environmental condition of a temperature of 83°C and a relative humidity of 50%.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]**[0001]**

[Field of the Invention]This invention has little degradation by ultraviolet radiation, and relates to the light reflex object which reflects illuminant light and realizes high-intensity.

[0002]

[Description of the Prior Art]The back light type liquid crystal display which has arranged the built-in type light source has spread widely. The typical composition of a side light system is as being shown in drawing 1 in back light type.

It consists of the light guide plate which performed halftone dot printing 12 to the transparent acrylic board 13, the light reflex object 11 installed in the one side, the diffusion board 14, and the cold cathode lamp 15 close to a light guide plate side.

The light introduced from the light guide plate side emits light in a halftone dot printing portion, prevents reflection of light, and a leak with the light reflex object 11, and forms a surface state uniformly light with the diffusion board 14.

[0003]In such a back light unit, it functions in order to realize the display appropriate for each purpose, while enabling it to use a light reflex object efficiently because of a display of the light of a built-in type light source. Since the specular reflexion made into GIRAGIRA is generally disliked, comparatively uniform luminosity is realized to the plane direction by scatter reflection, and to give natural sensibility is needed for those who see. It is required that the light reflector used especially for the side light system of a liquid crystal display should not have brightness unevenness in a plane direction, and should reflect uniformly the light which carries out a strike-through from a light guide plate.

[0004]From the former, a white polyester film which is indicated to JP,4-239540,A was used for this use in many cases. However, the fall with temporal change of a color tone and luminosity which there is a portion heated by not less than 80 ** with the heat generated from illuminant

light near the illuminant light, and is generated from illuminant light and in which a reflector mainly causes yellowing by the light near ultraviolet radiation might be caused.

[0005]

[Problem(s) to be Solved by the Invention]In view of such conventional technologies, this invention does not generate yellowing like the white polyester film used as a reflector from the former, but an object of this invention is to provide the reflector which does not cause change of a color tone over a long period of time.

[0006]

[Means for Solving the Problem]As a result of repeating examination wholeheartedly, by setting up conditions, such as color difference ΔE_H after opacity, a whiteness degree, reflectance, area draw magnification, and an optical irradiation test, within the limits of specification, this invention persons found out that a light reflex object which does an expected effect so was acquired, and reached this invention.

[0007]In a whiteness degree, reflectance R_0 this invention not less than 90% not less than 95% Namely, not less than 92%, [opacity] It is a light reflex object which consists of thermoplastics whose area draw magnification is 22 to 80, and a biaxially oriented film containing a filler, A light reflex object, wherein color difference ΔE_H after glaring by irradiation intensity 90 mW/cm² for 10 hours from a metal halide lamp installed in a position which separated 10 cm by 83 ** and an environmental condition of 50% of relative humidity is ten or less is provided.

[0008]As for a light reflex object of this invention, it is preferred that reflectance R_0 is not less than 92%, and it is preferred that difference ΔR of reflectance 10-hour exposure before calculated by a formula (1) and after an exposure is 10% or less. It is preferred that it is that a crack is not accepted to be to the surface after a 10-hour exposure.

[Equation 3] $\Delta R = R_0 - R_1$ (1)

(In an upper type, R_0 is the reflectance before a 10-hour exposure, and R_1 is the reflectance after a 10-hour exposure)

As for a biaxially oriented film which constitutes a light reflex object of this invention, it is preferred that a void content calculated by a formula (2) is 15 to 60%.

[Equation 4]

$$\text{空孔率 (\%)} = \frac{\rho_0 - \rho}{\rho_0} \times 100 \quad (2)$$

(In an upper type, ρ_0 is true density and ρ is the density of an oriented film.)

[0009]As for the biaxially oriented film which constitutes the light reflex object of this invention, it is preferred that have a surface layer (B) at least on one side of a base material layer (A) and a base material layer (A), and a base material layer (A) contains 0.5 to 62 % of the weight, and a surface layer (B) contains less than 1% of the weight of an ultraviolet radiation absorption filler. As for the mean particle diameter of the inorganic filler contained in said base material layer (A), or the mean-dispersion particle diameter of an organic filler, it is preferred that it is within the limits below 0.1 micrometers or more 1.5 micrometers.

[0010]

[Embodiment of the Invention]Below, the light reflex object of this invention is explained in detail. "-" as used herein means the range which includes the numerical value indicated before and behind that as the minimum and the maximum, respectively. The kind in particular of thermoplastics used for the light reflex object of this invention is not restricted. For example, ethylene resin, such as high density polyethylene and medium density polyethylene, Or olefin system resin, such as propylene resin, polymethyl-1-pentene, and an ethylene cyclic olefin copolymer, Nylon 6, nylon 6, 6, nylon 6, 10, nylon 6, polyamide system resin of 12 grades, Polyethylene terephthalate, its copolymer, polycarbonate, ATAKU tick polystyrene, syndiotactic polystyrene, a polyphenylene sulfide, etc. are mentioned. Two or more sorts can be mixed and these can also be used. Also in these, it is preferred to use olefin system resin. Also in olefin system resin, it is preferred to use propylene resin and high density polyethylene from a cost aspect and a waterproof and chemical-resistant field, and especially the thing for which propylene resin is used is preferred.

[0011]Use as the main ingredients polypropylene and propylene in which it is a propylene homopolymer and an eye SOTAKU tick or syndiotactic, and various tacticity are shown as this propylene resin, and This, A copolymer with the alpha olefin of ethylene, butene-1, the hexene-1, and heptene-1,4-methylpentene-1 grade is used. Two element systems, three element systems, or four element systems may be sufficient as this copolymer, and a random copolymer may also be a block copolymer. When using propylene resin, in order to make ductility good, it is good to blend the thermoplastics whose melting point is lower than propylene resin, such as polyethylene, polystyrene, and an ethylene-vinyl acetate copolymer, three to 25% of the weight.

[0012]As for such thermoplastics, it is preferred to use it at 38 to 91.5 % of the weight into a biaxially oriented film, it is more preferred to use it at 44 to 89 % of the weight, and it is still more preferred to use it at 50 to 86 % of the weight.

[0013]As a filler used for this invention with thermoplastics, various inorganic fillers or an organic filler can be used. As for an inorganic filler or an organic filler, it is preferred to use it at 8.5 to 62 % of the weight into a biaxially oriented film, it is more preferred to use it at 11 to 56 % of the weight, and it is still more preferred to use it at 14 to 50 % of the weight. As an

inorganic filler, calcium carbonate, calcination clay, silica, diatomite, talc, barium sulfate, alumina, an ultraviolet radiation absorption filler, etc. are mentioned. A titanium dioxide, a zinc oxide, etc. are mentioned as an ultraviolet radiation absorption filler. As an organic filler, polyethylene terephthalate, polybutylene terephthalate, Polycarbonate, nylon 6, nylon 6, 6, a cyclic olefin polymer, What has the melting point (for example, 120-300 **) or glass transition temperature (for example, 120-280 **) of polyolefin resin higher than the melting point of cyclic olefin and ethylene, such as a copolymer, is used.

[0014]One sort may be chosen as a biaxially oriented film from the above-mentioned inorganic filler or an organic filler, this may be alone used for it, and two or more sorts may be chosen, combined and used for it. When using it combining two or more sorts, an organic filler and an inorganic filler may be mixed and used.

[0015]In order to give the desired light reflex characteristic to the reflector of this invention, it is uniform in a biaxially oriented film, and it is preferred to generate the detailed hole near a perfect circle so much. The mean particle diameter of the inorganic filler contained in a base material layer (A) for adjustment of the hole size generated with extension shaping mentioned later, Or the mean-dispersion particle diameter of an organic filler is preferred, and each uses the thing of the range below 1.5 micrometers of 0.1 micrometers or more, the range whose each is 0.15-1.4 micrometers more preferably, and the range whose each is 0.2-1.3 micrometers especially preferably. When mean particle diameter or mean-dispersion particle diameter is not less than 1.5 micrometers, there is a tendency for a hole to become uneven. When mean particle diameter or mean-dispersion particle diameter is smaller than 0.1 micrometer, there is a tendency for a predetermined hole to no longer be acquired.

[0016]an adjustment of the porosity generated with extension shaping mentioned later sake -- the loadings of the above-mentioned filler to the inside of a biaxially oriented film -- volume conversion -- desirable -- 3.0 to 35 volume % -- it can be more preferably used in the range of 4.0 - 30 volume %. When there are few loadings of a filler than 3.0 volume %, there is a tendency for the sufficient number of holes to no longer be obtained. When there are more loadings of a filler than 35 volume %, there is a tendency the crease wrinkles by the shortage of stiffness become easy to produce.

[0017]The biaxially oriented film used by this invention may consist of monolayers, and more than two-layer may be laminated. As that by which more than two-layer was laminated, what formed the surface layer (B) at least in one side of a base material layer (A) and this base material layer (A), for example can be illustrated. How to laminate a publicly known laminating method, for example, the resin fused with two or more extrusion machines, within one set of a die with a feed block or a multi-manifold by not being limited especially concerning a laminating method (co-extrusion), The method of laminating by melting extrusion lamination, the method of laminating by the dry laminate using adhesives, etc. can be used. When multilayer structure

is a three-tiered structure of the surface layer (B) / base material layer (A) / back layer (C), for example, a base material layer (A) can be made to contain an ultraviolet radiation absorption filler 4- 35% of the weight especially 3.5 to 50% of the weight 0.5 to 62% of the weight preferably. A surface layer (B) may be made to contain an ultraviolet radiation absorption filler 0.1 to 0.9% of the weight preferably less than 1% of the weight at least. If the loadings of the ultraviolet radiation absorption filler of a base material layer (A) exceed 62 % of the weight, will cause influence to the whiteness degree of a light reflex object, and brightness lowering will be caused, and there is a tendency to become easy to raise an extension piece at the time of manufacture of a biaxially oriented film.

[0018]In order to form a desirable hole, it is effective to use the inorganic filler which specific surface area is more than 20,000-cm²/g, for example, and does not contain a particle with a particle diameter of not less than 10 micrometers in a base material layer (A) at least. It is preferred that the particle size distribution by which such conditions are fulfilled especially uses sharp calcium carbonate.

[0019]0.1 micrometers or more of thickness of a surface and rear surface layer are 0.1 micrometers or more less than 1.5 micrometers preferably -- and less than 15% of the overall thickness of a light reflex object -- desirable -- 0.2- it is 0.5 to 5% still more preferably 10%.

[0020]A fluorescent brightener, stabilizer, light stabilizer, a dispersing agent, lubricant, etc. may be blended with the biaxially oriented film of the reflector of this invention as occasion demands. As stabilizer, stabilizer, such as a steric exclusion phenol system, the Lynn system, an amine system, as light stabilizer, 0.001 to 1% of the weight, Light stabilizer, such as steric exclusion amine, a benzotriazol system, a benzophenone series, as a dispersing agent of an inorganic filler, 0.001 to 1% of the weight, Higher fatty acid, such as a silane coupling agent, oleic acid, and stearic acid, metallic soap, polyacrylic acid, polymethacrylic acid, or those salts may be blended 0.01 to 4% of the weight.

[0021]A general biaxial extension method can be used as a forming process of the compound containing thermoplastics and a filler. After extruding melting resin to a sheet shaped using the monolayer, or the multilayer T die and I die which were connected to the screw die pressing appearance machine as an example. The simultaneous biaxial extension by the combination of a biaxial extension method, and tenter oven and a linear motor which combined the vertical extension using the peripheral speed difference of the roll group and the lateral orientation which uses tenter oven, etc. are mentioned.

[0022]Extension temperature is a temperature lower 2-60 ** than the melting point of the thermoplastics to be used, and when resin is a propylene homopolymer (melting point of 155-167 **), 110-120 ** is preferred at the time of 152-164 ** and high density polyethylene (melting point of 121-134 **). The amount of 20-350-m/of a stretching speed is desirable.

[0023]In order to adjust the size of the hole generated in a biaxially oriented film, area draw

magnification = (lengthwise direction draw magnification L_{MD}) x (transverse direction draw magnification L_{CD}) considers it as 22 to 80 times as many ranges, It is preferred to use 25 to 70 times as many ranges, and it is more preferred to use 28 to 60 times as many ranges. When the thermoplastics to be used is propylene resin, there is a tendency for area draw magnification to break out in less than 22 times in stretching unevenness, and for a uniform biaxially oriented film not to be obtained, but for the desired light reflex characteristic to no longer be obtained by the light reflex object of this invention.

[0024]in order to adjust the aspect ratio of the hole generated in a biaxially oriented film -- the ratio of lengthwise direction draw magnification L_{MD} and transverse direction draw

magnification $L_{CD} -- L_{MD}/L_{CD}$ considers it as the range of 0.25-2.7 preferably, and is more preferably taken as the range of 0.35-2.3. When area draw magnification deviates from 22 to 80 times or L_{MD}/L_{CD} deviates from the range of 0.25-2.7, there is a tendency which becomes is hard to be acquired in the detailed hole near a perfect circle.

[0025]In order to adjust the quantity per unit volume of a hole which generates the light reflex inside of the body of this invention, let a void content be 15 to 55% of range more preferably 3 to 60%. A "void content" as used herein means the value calculated according to the above-mentioned formula (2). ρ_0 of a formula (2) expresses true density and ρ expresses the density (JISP-8118) of an oriented film. Unless the material before extension contains a lot of air, true density is almost equal to the density before extension. Generally the density of the biaxially oriented film used by this invention is the range of 0.55 - 1.20 g/cm³, density becomes small and a void content becomes large, so that there are many holes. The one where a void content is larger can also raise a surface reflection property.

[0026]40-400 micrometers of thickness of the biaxially oriented film after extension are 80-300 micrometers more preferably. When thickness is thinner than 40 micrometers, there is a tendency which the strike-through of light produces. When thickness is thicker than 400 micrometers, there is a tendency for a back light unit to become thick too much.

[0027]The opacity (based on JIS P-8138) of the light reflex object of this invention is not less than 97% preferably not less than 95%. There is a tendency which the strike-through of light produces in less than 95%.

[0028]The whiteness degree (based on JIS L-1015) of the light reflex object of this invention is not less than 95% preferably not less than 90%. There is a tendency which the absorption of light produces in less than 90%.

[0029]Suppose that one color difference $**E_H$ after glaring by irradiation intensity 90 mW/cm² for 10 hours from the metal halide lamp installed in the position which separated 10 cm by 83 ** and the environmental condition of 50% of relative humidity is the light reflex object of this

invention ten or less of the feature. If color difference $**E_H$ exceeds ten, there is a tendency to cause yellowing under the operating environment of a light reflex object. As for color difference $**E_H$ of the light reflex object of this invention, it is preferred that it is five or less.

[0030]"Color difference $**E_H$ " in this specification refers to the color difference by the color difference formula of the hunter of JIS Z-8730, and means the value calculated according to a following formula.

[Equation 5] $**E_H = [(**L)^2 + (**a)^2 + (**b)^2]^{1/2}$ top type, $**E_H$ is the color difference by a hunter's color difference formula, and $**L$, $**a$, and $**b$ are the differences of the psychometric lightness L of two superficial colors in a hunter's color difference formula and chromaticness-index a, and b, respectively.

[0031]Iwasaki Electric Co., Ltd. make:eye super UV tester SUV-W13 was used for measurement of color difference $**E_H$ in this specification. Iwasaki Electric Co., Ltd. make and trade name:M04L21 WB/SUV was used as a metal halide lamp which is a light source. Having set test temperature as 83 ** is based on **** equivalent conditions when the same measuring device of YUPO FPG150 (trade name) which is a synthetic paper by YUPO corporation is used.

[0032]An antioxidant is blended in order to make color difference $**E_H$ of a light reflex object or less into ten. As an antioxidant, although an amine system and a phenolic antioxidant are effective, it is preferred to use the Lynn system antioxidant together for prevention from photodegradation by ultraviolet rays. These antioxidants usually carry out 0.01-10 weight-section combination to thermoplastics 100 weight section which is the main ingredients of an oriented film.

[0033]As for a light reflex object of this invention, it is preferred that reflectance R_0 is not less than 92%, and it is more preferred that it is not less than 94%. There is a tendency which a strike-through of light produces in less than 92% in reflectance R_0 . It is preferred that difference deltaR of reflectance 10-hour exposure before and after an exposure is 10% or less. When it exceeds 10%, there is a tendency for a luminosity to fall, by use of a prolonged back light. It is preferred that it is that a crack is not accepted to be to the surface after the above-mentioned 10-hour exposure. Tolerance over surface light degradation which was excellent in such this invention can be attained scattering incident light by a detailed hole which exists in a biaxially oriented film, and by blending the above-mentioned ultraviolet radiation absorption filler which performs ultraviolet radiation absorption. A refractive index of an ultraviolet radiation absorption filler is high compared with a refractive index (1.59) of calcium carbonate which is a general inorganic filler so that refractive indicees of a titanium dioxide used, for example in this

application example and a zinc oxide may be 2.76 and 2.0, respectively. For this reason, an improvement of the light reflex object characteristic can be aimed at by using an ultraviolet radiation absorption filler. In order to give the desired light reflex characteristic to a light reflex object of this invention, it is preferred to use an ultraviolet radiation absorption filler for a base material layer (A), mixing with an inorganic filler (except for an ultraviolet radiation absorption filler) and/or an organic filler to it. In order to suppress degradation of matrix resin of a film by ultraviolet radiation, it is preferred to add a radical supplementary agent. As a radical supplementary agent, hinder TOAMIN system stabilizer (HALS) etc. are mentioned and it is usually considered as 0.01 to 10 weight section as an addition to thermoplastics 100 weight section which is the main ingredients of an oriented film.

[0034] Unless the desired light reflex characteristic is checked to this invention, a coated layer may be provided in a surface and rear surface of a light reflex object of this invention. It is preferred for halftone dot printing of a white paint to be performed in order especially to raise the light reflex characteristic in a rear face, and to provide a coated layer for printing nature improvement. Coating of the coated layer can be carried out by a publicly known method so that thickness may be set to 0.5-20 micrometers.

[0035] Shape in particular of a light reflex object of this invention is not restricted, but can be suitably determined according to the purpose of use or an operating mode. Usually, although it is used for tabular or film state, carrying out, even if it is a case where it is used in other shape, as long as it uses it as a light reflex object, it is included within the limits of this invention.

[0036] A light reflex object of this invention is very useful as a back light type and a light reflex object which constitutes a display of a side light system especially. Since a light reflex object reflects uniformly without brightness unevenness in a plane direction light which carries out a strike-through from a light guide plate, the liquid crystal display of a side light system using a light reflex object of this invention can give natural sensibility to those who see. The light reflex object of this invention can use reflecting indoor light, without using not only a back light type liquid crystal display such but a built-in type light source also for an intended low-power-consumption type display. It can use also for the back of an object for lighting interior of a room outside, and a light source for illumination signboards broadly.

[0037]

[Example] An example, a comparative example, and the example of an examination are indicated below, and this invention is explained to it still more concretely. Material, the amount used, a rate, operation, etc. which are shown below can be suitably changed, unless it deviates from the meaning of this invention. Therefore, the range of this invention is not restricted to the example shown below. The material used by the following examples and comparative examples is packed into Table 1, and is shown.

[0038] (Examples 1-5 and comparative examples 1-3) The constituent (A) which mixed a

propylene homopolymer, high density polyethylene, heavy calcium carbonate, the titanium dioxide, and the zinc oxide in the quantity of the statement to Table 2, Melt kneading of the constituent (B) and (C) which mixed a propylene homopolymer, heavy calcium carbonate, the titanium dioxide, and the zinc oxide in the quantity of the statement to Table 2 was carried out at 250 ** using three sets of respectively separate extrusion machines. Then, one set of a coextruded die was supplied, and within the die, (B) and (C) were extruded after lamination to both sides of (A), it extruded to the sheet shaped, and laminated material was obtained by cooling to about 60 ** with a cooling roller. To the above-mentioned constituent (A), (B), and (C), as opposed to thermoplastics 100 blended weight section -- as an antioxidant -- phenol system stabilizer (the Ciba-Geigy make.) Trade name: 0.05 weight sections of hindered amine system stabilizer (the Sankyo Co., Ltd. make, trade name: HA-70G) was blended as IRUGA NOx 1010 0.05 weight section, Lynn system stabilizer (product [made from G E Plastic] trade name: Weston 618) 0.05 weight section, and a radical supplementary agent.

[0039] After reheating this laminated material at 145 **, it extended for magnification given in Table 2 to the lengthwise direction using the peripheral speed difference of many roll groups, and it reheated to about 150 ** again, and extended for the magnification of the statement in the transverse direction by the tenter in Table 2. Then, after carrying out annealing processing at 160 **, it cooled to 60 ** and the light reflex object of three layer systems (B/A/C) which carry out the slit of the handle part and have the thickness of a statement in Table 2 was acquired. A surface layer (B) serves as a field which constructs a liquid crystal display and touches a *** case with a light guide plate.

[0040] The comparative example 1 is manufactured by the method indicated in the Example 1 of JP,2001-39042,A which blended the titanium dioxide with the surface and rear surface of the biaxially oriented film. The comparative example 2 acquired the light reflex object like Example 2 in Example 2 except not having used a titanium dioxide, but having changed the kind of heavy calcium carbonate of a constituent (A) as given in Table 2, and having changed the loadings of the propylene homopolymer as given in Table 2. The commercial white polyester film (Toray Industries, Inc. make and trade name: E60L) was used for the comparative example 3 as a light reflex object.

[0041] (Example of an examination) About the manufactured light reflex object of Examples 1-5 and the comparative examples 1-3, whiteness degree, opacity, void content, reflectance, and color difference E_H and a surface degradation state were measured. The whiteness degree was measured based on JIS L-1015 using the measuring device (Suga Test Instruments [Co., Ltd.] make: SM-5). Opacity was measured based on JISP-8138 using the measuring device (Suga Test Instruments [Co., Ltd.] make: SM-5).

[0042] The void content measured the density and true density of the oriented film based on JIS P-8118, and they were calculated by the above-mentioned formula (2) and it asked for

them. Using the measuring device (Hitachi Make: U-3310), reflectance was measured based on JISZ-8701 and the average reflectance of light with a wavelength of 400-700 nm was used for it. Difference deltaR of reflectance measured the reflectance after carrying out an optical exposure by a following condition for 10 hours before carrying out an optical exposure by a following condition, and it was calculated by the above-mentioned formula (1) and it asked for it.

[0043]Color difference $**E_H$ was calculated by measuring the color difference after glaring by irradiation intensity 90 mW/cm^2 for 10 hours from the metal halide lamp installed in the position which separated 10 cm by 83 ** and the environmental condition of 50% of relative humidity using the above-mentioned measuring device. About the surface degradation state of the light reflex object, the surface state after the above-mentioned 10-hour exposure was evaluated as follows.

O : the whole surface of a light reflex object is not different from before an examination, and a surface crack does not have it.

x: The surface crack occurred on the whole surface of the light reflex object.

Each of these measurement results are summarized in Table 3, and are shown.

[0044]

[Table 1]

材料名	内 容
プロピレン単独重合体 (PP1)	プロピレン単独重合体[日本ポリケム(株)製、ノバテックPP:MA4] (MFR(230°C、2.16kg荷重)=5g／10分)
プロピレン単独重合体 (PP2)	プロピレン単独重合体[日本ポリケム(株)製、ノバテックPP:MA3] (MFR(230°C、2.16kg荷重)=11g／10分)
高密度ポリエチレン (HDPE)	高密度ポリエチレン[日本ポリケム(株)製、ノバテックHD:HJ360] (MFR(190°C、2.16kg荷重)=5.5g／10分)
CaCO ₃ (a)	平均粒径0.93 μm、比表面積25,000cm ² /g、粒径5μm以上の粒子を含まない重質炭酸カルシウム[丸尾カルシウム(株)製、カルテックス5]
CaCO ₃ (b)	平均粒径1.5 μm、14,800cm ² /g の重質炭酸カルシウム[白石カルシウム(株)製、ソフトン1800]
CaCO ₃ (c)	平均粒径0.57 μm、比表面積23,000cm ² /g、粒径7μm以上の粒子を含まない重質炭酸カルシウム[丸尾カルシウム(株)製、カルテックス7]
TiO ₂	平均粒径0.2 μmの二酸化チタン[石原産業(株)製、CR60]
ZnO	平均粒径0.6 μm酸化亜鉛[堺化学工業(株)製、2種]

[0045]

[Table 2]

FP1	二輪延伸フィルム										先反射体の特性				厚み(μm)			
	高特層(A) 組成(重量%)					高特層(C) 組成(重量%)					延伸倍率(倍)							
	HDPE	CaCO ₃	TiO ₂	ZnO	PP2	CaCO ₃	TiO ₂	ZnO	PP2	面張	巻	横	全厚	各層の層厚 (B/A)/C				
実施例1	58	10	(e) 30	4	0	97	(b) 25	0.5	0	100	0	0	44.6	4.8	9.3	150	0.6/48/0.5	
実施例2	50	10	(c) 30	10	0	97	(b) 25	0.5	0	97	(b) 2.5	0.5	0	35.7	4.2	8.6	170	0.6/165/0.5
実施例3	54	10	(c) 30	6	0	70	(c) 28.6	0.5	0	70	(c) 28.6	0.5	0	31.2	3.8	8.2	170	0.5/169/0.5
実施例4	50	10	(c) 30	0	10	97	(b) 2.5	0	0.5	97	(b) 2.5	0	0.5	35.7	4.2	8.5	170	0.5/169/0.5
実施例5	55	10	(c) 6	50	0	97	(e) 2.5	0.5	0	87	(d) 2.5	0.5	0	35.7	4.2	8.6	170	0.5/169/0.5
比較例1	65	10	(a) 25	0	0	99	0	1	0	100	0	0	42.5	5.0	8.5	60	3/55/1	
比較例2	60	10	(b) 30	0	0	97.5	(b) 2.5	0	0	87.5	(b) 2.5	0	0	35.7	4.2	8.5	170	0.5/169/0.5
比較例3															—	186		

白色ポリエチレンフィルム(裏地樹脂: 製品名:E60L)

[0046]

[Table 3]

	光反射体の部位	10時間後											
		アイスバー状態時					反射率						
白色度 W (%)	不透明度 (%)	空孔率 R _b (%)	反射率 L _a (%)	明度指數 a	指數 b	R _b (%)	L _a (%)	指數 a	指數 b	ΔR	ΔE _u	表面劣化 状態	
実施例1	97	98	35	85	-0.2	2.0	95	88	-0.2	1.9	0	0	
実施例2	91	100	40	96	-0.1	1.6	96	97	-0.1	1.6	0	0	
実施例3	98	100	43	96	-0.6	1.4	96	98	-0.6	1.4	0	0	
実施例4	97	100	43	96	-0.1	1.6	96	98	-0.1	1.6	0	0	
実施例5	97	100	15	97	96	-0.2	1.3	97	96	-0.2	1.3	0	0
比較例1	90	93	40	90	97	-0.2	2.2	90	97	-0.2	2.2	0	0
比較例2	95	97	35	94	96	0.9	2.1	93	96	-0.9	1.1	1	x
比較例3	96	99	—	98	98	1.5	-0.4	77	87	0.8	24.0	19	30

[0047]

[Effect of the Invention] As mentioned above, according to the light reflex object of this invention, the bright back light which cannot turn yellow easily in an operating environment and does not have change of a color tone over a long period of time is realizable. According to this invention, improvement in luminosity can be aimed at cheaply, without depending on the ingredient which has a spectroscopic feature.

[Translation done.]

*** NOTICES ***

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- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.**** shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]

[Claim 1]In a whiteness degree, reflectance R_0 not less than 90% not less than 95% Not less than 92%, [opacity] It is a light reflex object which consists of thermoplastics whose area draw magnification is 22 to 80, and a biaxially oriented film containing a filler, A light reflex object, wherein color difference ** E_H after glaring by irradiation intensity 90 mW/cm² for 10 hours from a metal halide lamp installed in a position which separated 10 cm by 83 ** and an environmental condition of 50% of relative humidity is ten or less.

[Claim 2]The light reflex object according to claim 1, wherein difference deltaR of reflectance shown with a following formula 10-hour exposure before and after an exposure is 10% or less.

[Equation 1] $\Delta R = R_0 - R_1 \quad (1)$

(In an upper type, R_0 is the reflectance before a 10-hour exposure, and R_1 is the reflectance after a 10-hour exposure.)

[Claim 3]The light reflex object according to claim 1 or 2, wherein a crack is not observed in the surface after a 10-hour exposure.

[Claim 4]The light reflex object according to any one of claims 1 to 3, wherein a void content shown with a following formula of said biaxially oriented film is 3 to 60%.

[Equation 2]

$$\text{空孔率 (\%)} = \frac{\rho_0 - \rho}{\rho_0} \times 100 \quad (2)$$

(In an upper type, ρ_0 is true density and ρ is the density of an oriented film.)

[Claim 5]Said biaxially oriented film has the surface layer (B) formed at least in one side of a base material layer (A) and this base material layer (A), The light reflex object according to any

one of claims 1 to 4, wherein a base material layer (A) contains 0.5 to 62 % of the weight and a surface layer (B) contains less than 1% of the weight of an ultraviolet radiation absorption filler.

[Claim 6]The light reflex object according to any one of claims 1 to 5 in which said base material layer (A) is characterized by mean particle diameter's containing 0.1-micrometer or more the inorganic filler below 1.5 micrometers, and mean-dispersion particle diameter containing organic 0.1-micrometer or more filler below 1.5 micrometers.

[Translation done.]